mode of dealing with some natural fact. By this method of teaching, that best of all faculties, originality, is fostered, whereby we mean not the making of new discoveries, but the habit of taking our own view of everything; in other words, the habit of independent thought, which habit is the nurse of Freedom. It is precisely because of its immense power of fostering this habit that we believe the teaching of science properly conducted is such a very desirable part of education. The difficulty of carrying out the joint teaching of the facts of science and the methods of mathematics, lies chiefly in the difficulty of getting men who are able to do it, that is to say, men who have a sufficient acquaintance with both subjects. This is the great temporary drawback to the spread of true scientific education. But as soon as the true character of that education is recognised, this drawback will only be temporary. Here it is, however, that the progress of these ideas at the University is so much to be desired. And here it is that the University is, let us hope, hastening to confer a great benefit on the country, by providing, for the teaching of others, men whose education has itself been carried out on this principle. This is one of the reasons for which we hope that there will be no long delay in the establishment of lectures there of an experimental nature on Physical Science. The benefit conferred by these, however, will not be complete, until it is arranged that the taking of a mathematical degree shall have ensured the knowledge of such subjects; and the possession of a certificate of attendance on some such course of lectures might well be imposed as a necessary preliminary to taking a degree with mathematical honours. Indeed we may hope that the day may not be far distant when some experimental knowledge of Physical Science will be demanded from all Cambridge students at the "little-go," along with the present Latin, Greek, and Mathematics, for this, more than anything else, would conduce to that which is now so eminently desirable—the existence of a body of persons able to carry out this joint teaching.

FORMS OF ANIMAL LIFE

Forms of Animal Life; being Outlines of Zoological Classification, based upon Anatomical Investigation, and illustrated by Descriptions of Specimens and of Figures. By George Rolleston, D.M., F.R.S., Linacre Professor of Anatomy and Physiology in the University of Oxford. (Oxford: Macmillan and Co., 1870; Clarendon Press Series.) II.

THE second part of this work consists of elaborate descriptions of fifty preparations in the New Museum at Oxford, designed to illustrate some of the typical specimens of the several animal classes. Thus, among Vertebrata, we have a dissection of the common rat, the skeleton of the same, separate vertebræ of the rabbit, the dissection and the skeleton of a pigeon, the bones of the head and trunk of a fowl, a dissection of the common English snake, vertebræ of a python, dissections and skeletons of a frog and a perch, and vertebræ of a cod.

These descriptions will no doubt be exceedingly useful to the author's pupils, but for others statements that "a black bristle has been passed under the aorta," or "a slip of blue paper under a fascicle of one of these muscles" do not afford much help. Moreover, there is a singular absence of directions how the student is to make these preparations for himself; directions which no one could give better than Professor Rolleston. It would surely have been a more desirable course to print this second part separately in the Museum catalogue; and, instead of mere descriptions of plates, drawn from ready-made dissections, to have given a full account of how first to catch, then to kill, and then to dissect and preserve the several animals mentioned in the third part of the book. The satisfactory way in which careful methods of dissection will preserve the whole of an animal for demonstration was lately well shown by the Curator of the Hunterian Museum, who prepared from a single very poor specimen of *Proteles cristatus* the complete skeleton (articulated so as to allow of each bone being removed without disturbing the rest), the stuffed skin, and all the important viscera. Now, methods of dissection of the so-called lower animals, are just what students of comparative anatomy want; and monographs of the anatomy of a single species like those of Bojanus, or of Krause, are rare even in Germany. Therefore knowing the admirable way in which practical zootomy is taught by Professor Rolleston, we had hoped that, following out his motto *παντὸς προσθεῖναι τὸ ἐλλεῖπον*, he would have described the steps of the several dissections so that other students might profit by his experience. The plates in the present work would serve very well to illustrate such a manual of dissection, especially if aided by such rough diagrams of relations of parts as every lecturer makes for himself on the black board.

Most of the plates in the third part are copied from actual preparations, and are evidently done with great pains; but it would have been well if some notion of the scale on which they are drawn had been added. The bibliography at the end of each description in Parts II. and III. is very valuable; indeed references are fully given throughout the book.

In the account of the dissection of *Helix pomatia* (pp. 48-54), we look with interest for any new facts as to the existence of a capillary systemic as well as pulmonary circulation in the Gasteropoda; since it has been stated that Mr. Robertson (who prepared all the specimens described) succeeded in demonstrating by injections that the supposed systemic lacunæ are only due to extravasation. This, however, appears not to be the case. We may particularly recommend the account given both of the shell and the soft parts of *Anodonta cygnea* (pp. 54-66, and also the description of Pl. v.), and the comparison with it of *Ascidia affinis* which follows. But perhaps the most valuable description is that of *Astacus fluviatilis* (pp. 90–119, and 205-210[*]), and especially three tables, of which the first compares the post-oral ganglia in *Astacus*, *Scorpio* and *Sphinx*, both at an early and at the adult period; while the second makes a similar comparison between the same ganglia in the *Amphipoda*, *Isopoda*, and *Orthoptera* (an order of insects which Prof. Rolleston regards as the least differentiated, and approaching nearest to Crustacea); and the third gives a view of the homologies of all the post-antennary segments and appendages in the four Arthropod classes. The views of Prof. Huxley are followed where he differs from M. Milne-Edwards, and the grounds of the several comparisons are clearly stated.

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[*] In Pl. vii. it ought to have been noted that the longitudinal division of the body is not quite complete, so that the *left* eye, antenna and antennule, are seen—all the other appendages belonging to the *right* side.

The Entozoa are illustrated by the *Coenurus* of the rabbit's muscle, which is regarded as probably of "the same species as the one individuals from which are, when in the cystic state, lodged usually in the brain of the sheep, and are the cause of the disease commonly known as the 'sturdy,' 'gid,' 'staggers,' or 'turnsick'" (p. 136). So that *C. cuniculi* is identical with *C. cerebralis.* There are also some diagrams of parts of Tænia in the cestoid state (pp. 246-252), from Leuckart and Van Beneden, with descriptions.

Several new terms are introduced in this work, and most of them are likely to be useful additions to nomenclature. Among them are the words "proctuchous" and "aproctous," which we have only seen before used to distinguish the *Turbellaria* with an anus from those without one. Would it not be possible to substitute *Brachionopoda* for the barbarous word "Brachiopoda," which is moreover too near to "Branchiopoda?" Several terms in common use are given by Dr. Rolleston in an improved form; and we think him quite justified in substituting *Myriopodia* for Myriapoda, *Annulata* for Annelida (which is only a pseudo-classical form of "Les Annelides," the name invented by Lamarck), and *Hedriophthalmata* for Edriophthalmata —though if this last change be made, it will be as well to write "*Hedræophthalma,*" since the root must be *ἑδραῖος*, not the doubtful diminutive *ἕδριον*, and the analogy of *μονόφθαλμος, μυριόφθαλμος* points out the true form of the termination. In the same way the word *Echinodermata* (which was first correctly applied by Stein to the *shells* of Echini) and *Pachydermata* ought to be written Echinoderma and Pachyderma, especially as the latter form is actually used by Aristotle. But there are probably too many words of this termination for the change to be easily accomplished. Useless synonyms, however, ought undoubtedly to be abandoned; such troublesome words, for instance, as Actinozoa, Ascidioidea, and Bryozoa, ought to yield to *Anthozoa, Tunicata,* and *Polyzoa,* for reasons of convenience, euphony, and priority.

The student will find it useful to note the following errata, in addition to those indicated in the book itself.

P. xiv. *monophydont* for *monophyodont* and *Montremata* for *Monotremata;* p. li., *furculum* for *furcula,* repeated p. 21 *bis* and p. 22; p. ciii., *classes Brachiopoda* for *class Brachiopoda;* p. 21, *obtusator* for *obturator;* p. 25, *Wirbel thiere* for *Wirbelthiere;* p. 35, *Körperban* for *Körperbau;* p. 78, *differs from the imago* for *differs from the larva;* p. 136, and again pp. 241 and 251, *Caenurus* for *Coenurus;* p. 160, *coenosare* for *coenosarc;* p. 224, *two sets of them and two rays respectively* for *two sets of three, &c.;* p. 252, *Thudichen* for *Thudichum;* and, in the index, *Vesicular* should read *Vesiculae,* while the reference to Prof. Turner will be found at p. 1. of the second part instead of p. i. of the Introduction. Lastly, at p. 251, line 10 from the bottom of the page, the figure 6 is misprinted for the letter *b.*

It is much to be hoped that a second edition of this thorough and painstaking work will soon be called for; since nothing would better prove the increased number of serious zoologists in this country. Should its learned author then see fit to unite the second and third parts together, and to add somewhat full directions for dissection, I venture to think that the book will be made even more useful than it already is.

P. H. PYE-SMITH

NEW ATLASES

The Complete Atlas of Modern, Classical, and Celestial Maps, together with Plans of the principal Cities of the World, constructed and engraved on steel under the superintendence of the Society for the Diffusion of Useful Knowledge, and including all the recent geographical discoveries, compiled from the latest and most authentic sources. Accompanied by alphabetical indexes to the modern and classical maps. 218 maps and plans.

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The Cyclopædian, or Atlas of General Maps, with an Index of the Principal Places in the World. 39 maps.

(London: Edward Stanford, 6 & 7, Charing Cross. 1870.)

AT the present time not a week passes which does not more and more enforce the necessity of everyone of us having an atlas of some sort or another to refer to, and, in fact, it may be said that in these days of rapid locomotion and intercommunication with every part of the planet, an atlas is the corner-stone of a library, even if that library otherwise consist merely of a Dictionary and a Blue Book, Imperial Calendar, or Post-office Directory.

Take the last six months. We have all of us been burning to know the ins and outs of that part of Africa, so far as they have been mapped, which we hope that Livingstone is still exploring for us. The Suez Canal has not only, to the amazement of school boys, made Africa an island as well as a continent; but children of a larger growth have had to talk about Port Saïd, the Bitter Lakes, and the Sweet Water Canal, thereby opening up a new region of minute geography; while the Pacific Railroad, now a *fait accompli,* has carried us at once into a part of the world about which the majority of us had thought but little; and we might easily go on multiplying other instances.

Geography, in fact, is now not only "one of the eyes of history," but it is the "eye" of every-day life among all Anglo-Saxon communities; and from this point of view it is satisfactory to see our foremost geographers and purveyors of maps keeping pace with the times, including "all the recent discoveries" in their publications, and bringing this very important information fairly within the reach of all. Let us add, that it is also satisfactory to see them little by little approaching the German standard of map-making, which, to speak candidly, they have not all reached.

We shall clear the ground for what we have to say of the atlases now under notice, if we state that the maps in all of them belong to the series brought out some time ago by the Society for the Diffusion of Useful Knowledge; that the two first on our list are of the size of the maps, and are for the library, while the third